

# The use of recycled rubber and textile, technologies and policies implemented in Poland



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**Poland**





## SMAPOL® - PRODUCTION

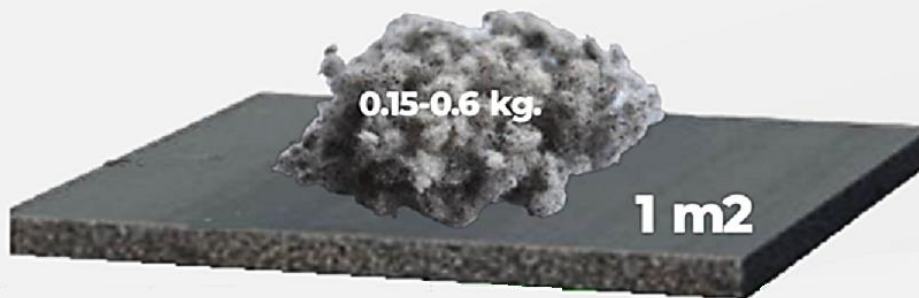


**Volumes:**  
800 kg/h, 2500 tons p.a.

**Plans:**  
Śrem & Krosno Odrzańskie

**Techological lines:**  
- 250 kg/h  
- 500 kg/h  
- 1000 kg/h

The approximate amount of SMAPOL used per 1sqm of 4cm thick asphalt road surface is about 0.15-0.6 kg



**SMAPOL®** qualifies for road construction applications according to National Technical Assessment no. IBDiM-KOT-2023/0913  
**SMAPOL®** factory production control plan is audited by SGS  
**SMAPOL®** is a unique solution within the tyre recycling industry

## PAVEMENT



**SURFACE  
DEFORMATIONS,  
DAMAGE**

(rutting, ravelling, etc.)



**CRACKING**

(„alligator” due to temperature  
and fatigue, etc.)



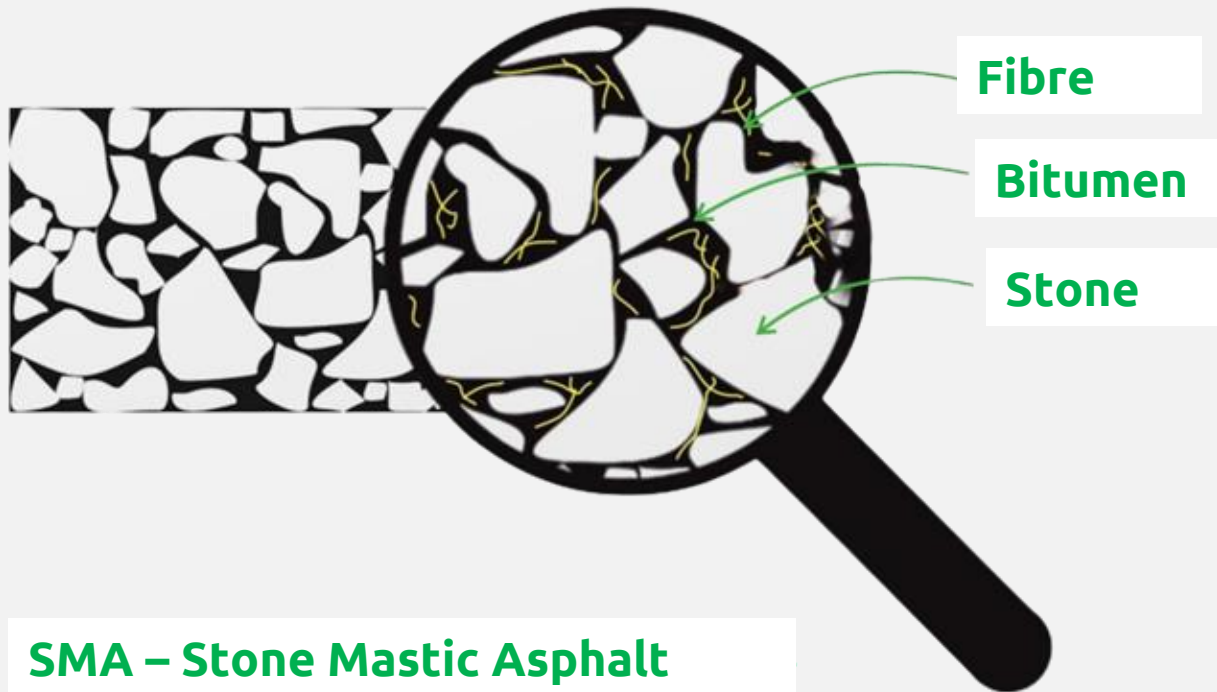
**DISINTEGRATION**

(pot holes, etc.)





## ASPHALT PAVEMENT



**SMA – Stone Mastic Asphalt**



Resistance to permanent deformation or rutting

Good durability due to high binder (bitumen) content



Good flexibility and resistance to fatigue, wear resistance, good surface texture

All these advantages are clearly visible when using bitumen modified with polymers such as SBS, SEBS, EVA itp. as well when using effective additives, mainly cellulose.



## SMAPOL® - stabilizing and reinforcing additive to stone-mastic asphalts

Produced from high quality fibres... used in tyre production



### SMAPOL®

1. High strength fibres (kevlar, nylon, poliester, poliamid, aramid)
2. Fibres resistant to ageing
3. Dimensionally stable fibres
4. Fibres with good adhesion to bitumens
5. Chemically resistant fibres



THE MISSING ELEMENT OF CIRCULARITY...

We packed it in a  
pellet, but it opens-up  
in asphalt mixes...

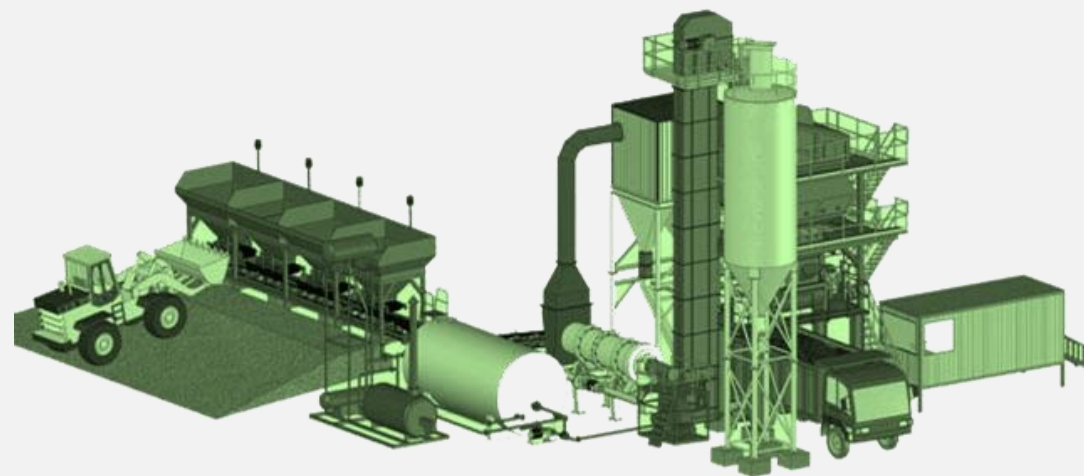


## SMAPOL®

- water-insoluble cylindrical granules (pellets)
- bulk density from 410 to 460 kg / m<sup>3</sup>
- dark grey colour
- length from 5 to 25 mm
- diameter 6,0 ± 1,0 mm



**SMAPOL®** can be fed into the mixer  
on the asphalt plant by any of the known  
methods and evenly mixed during the  
production of asphalt mixes at standard  
temperatures and in standard technology





## SMAPOL® - EFFICIENCY



**RUTTING RESISTANCE**



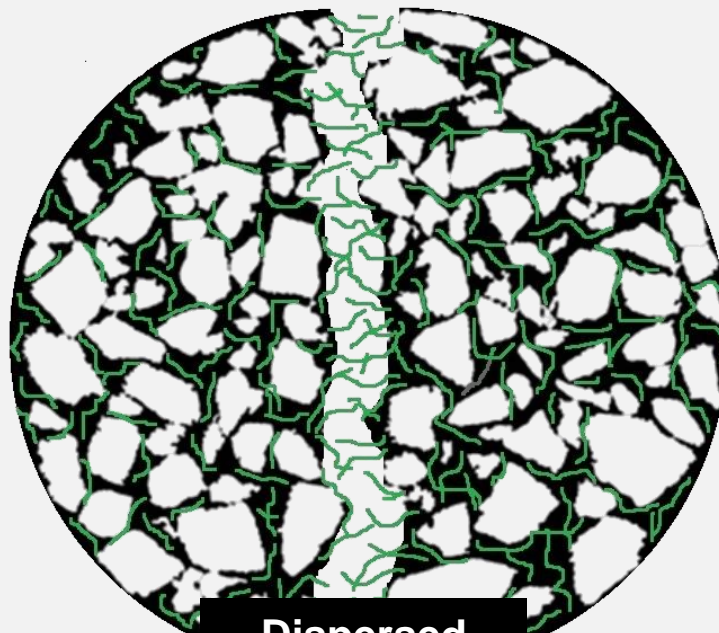
**FATIGUE RESISTANCE**



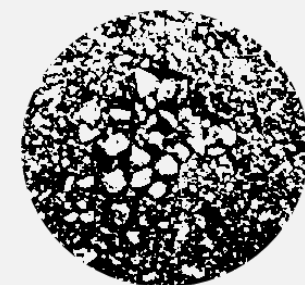
**CRACK RESISTANCE**



**WATER & FROST RESISTANCE**



**Dispersed  
reinforcement**

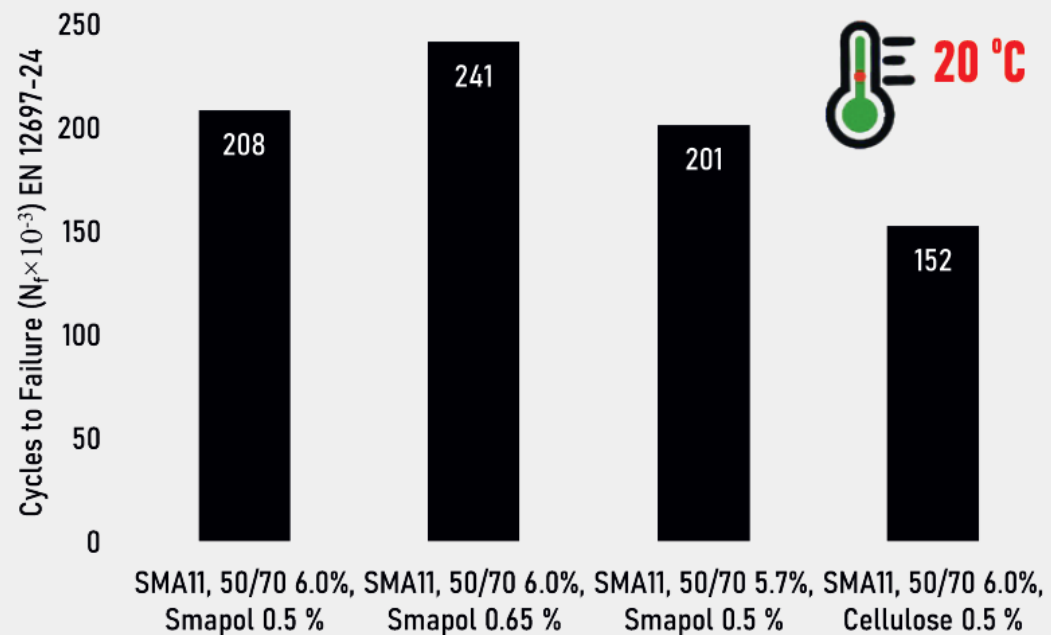


**Resistance to delamination,  
segregation and binder  
drainage**





## SMAPOL® - EFFICIENCY



SMA11, 50/70 6.0%, Cellulose 0.5 %

8.0

SMA11, 50/70 5.7%, Smapol 0.5 %

5.6

SMA11, 50/70 6.0%, Smapol 0.65 %

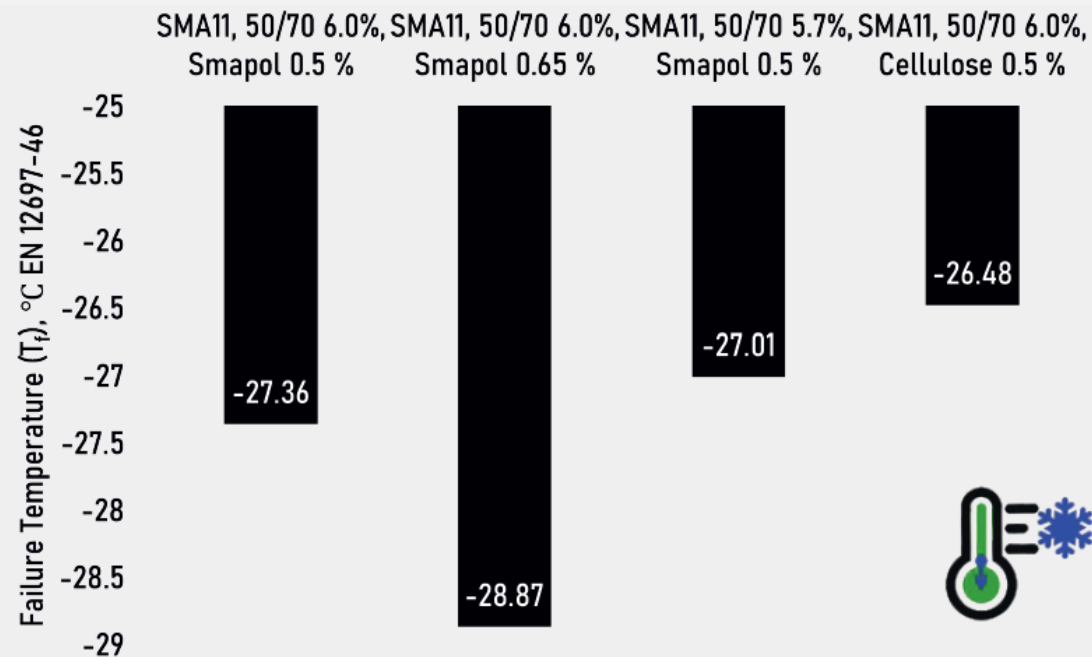
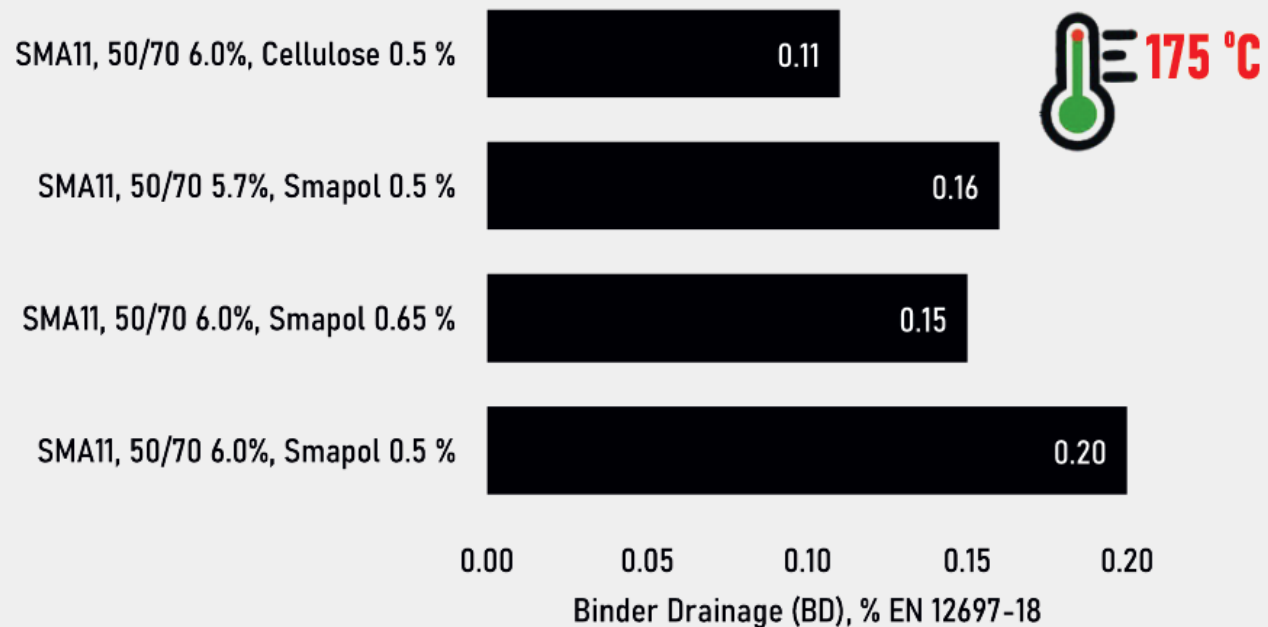
5.7

SMA11, 50/70 6.0%, Smapol 0.5 %

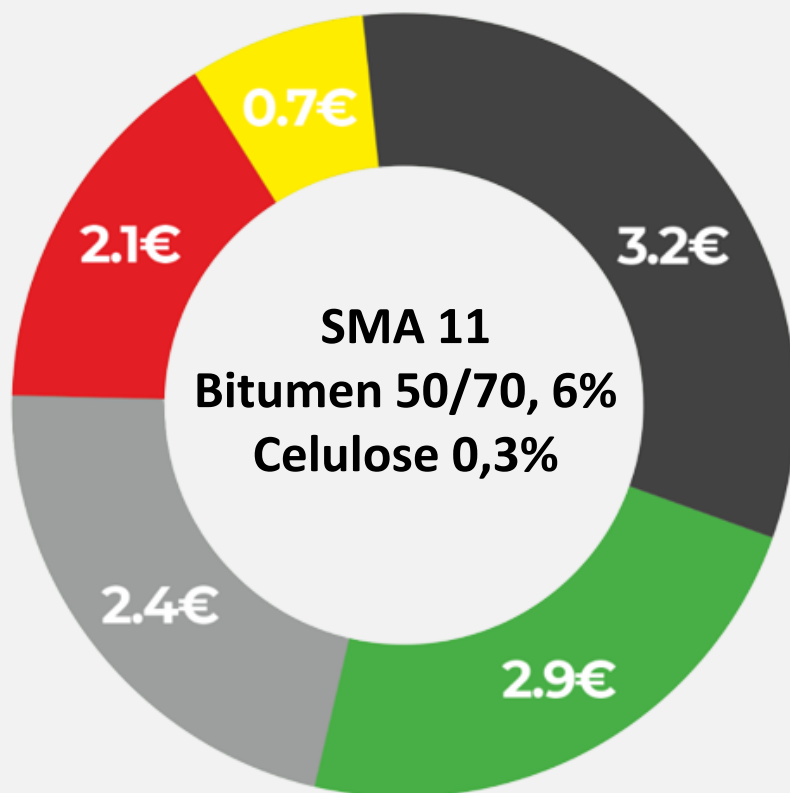
7.8

Proportional Rut Depth (PRD), % EN 12697-22

## SMAPOL® - EFFICIENCY



## SMAPOL® - ECONOMIC EFFICIENCY

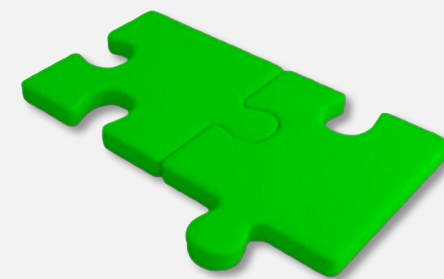


**The annual economic effect of extending the service life of the pavement (4cm) [EUR/sq.m]**

- SMA 11, bitumen 50/70 6%, cellulose 0,5%
- SMA 11, PmB 6,5%, cellulose 0,3%
- SMA 11, bitumen 50/70 6%, Smapol 0,5%
- SMA 11, bitumen 50/70 6%, Smapol 0,65%
- SMA 11, bitumen 50/70 5,7%, Smapol 0,5%

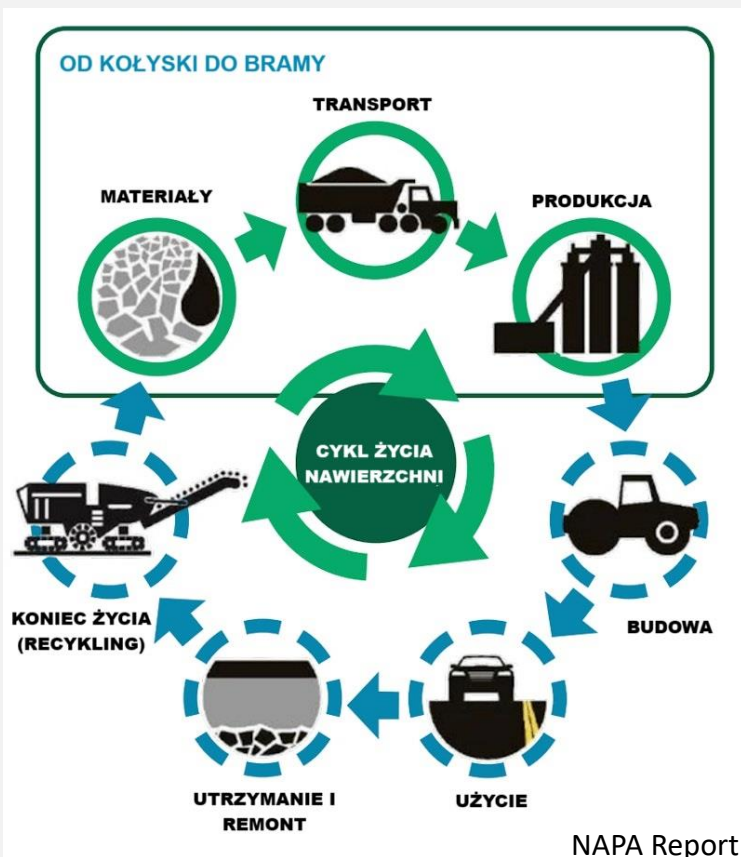
### Synergy

SMAPOL + PmB  
SMAPOL + **RMB**

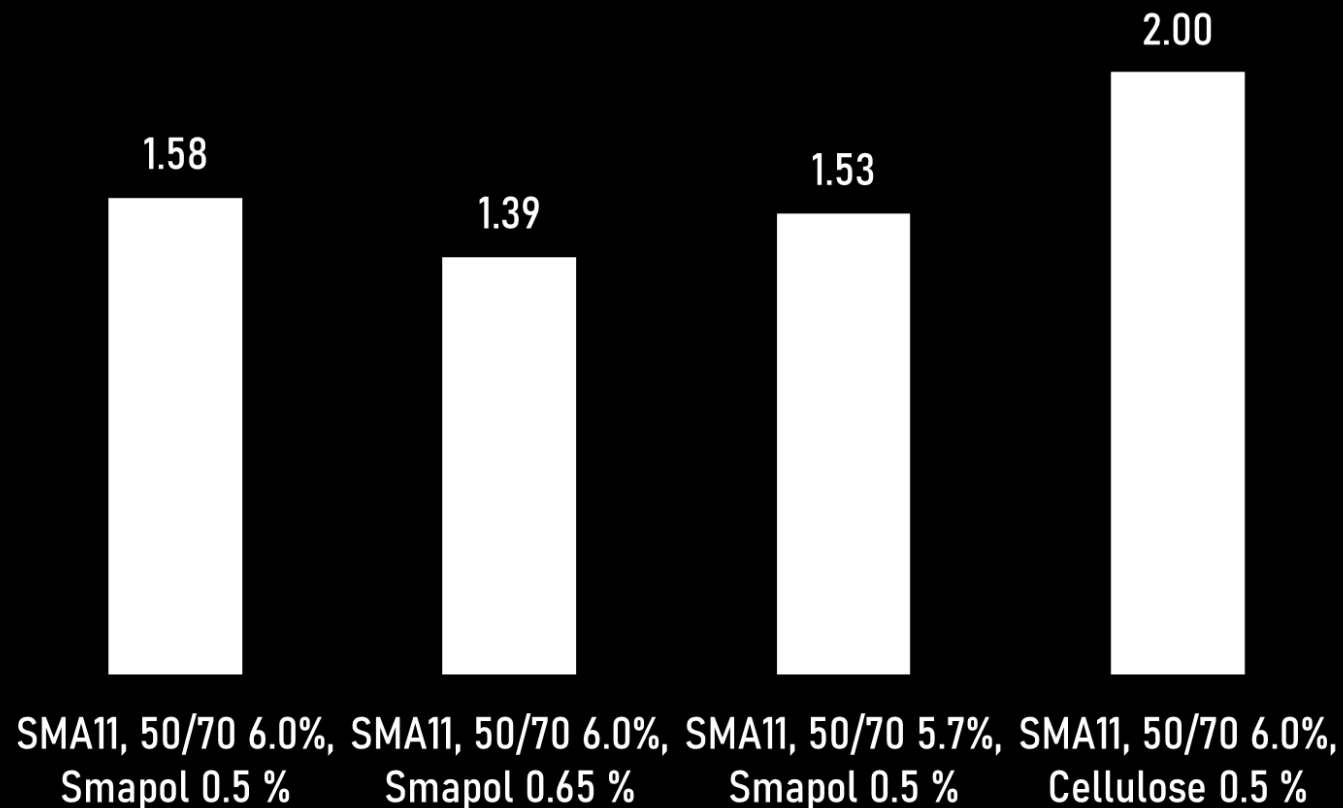




## SMAPOL® - CO<sub>2</sub> FOOTPRINT



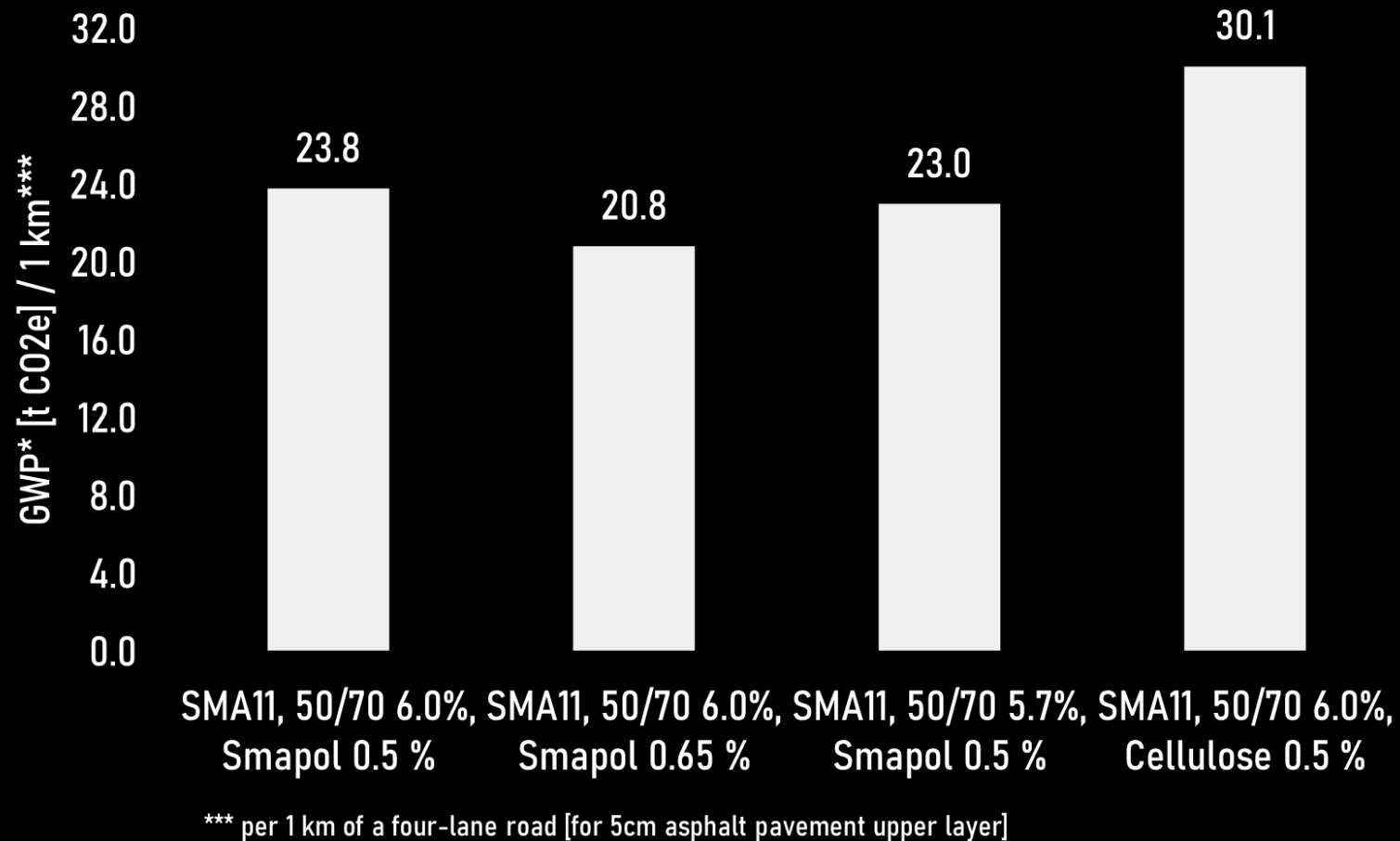
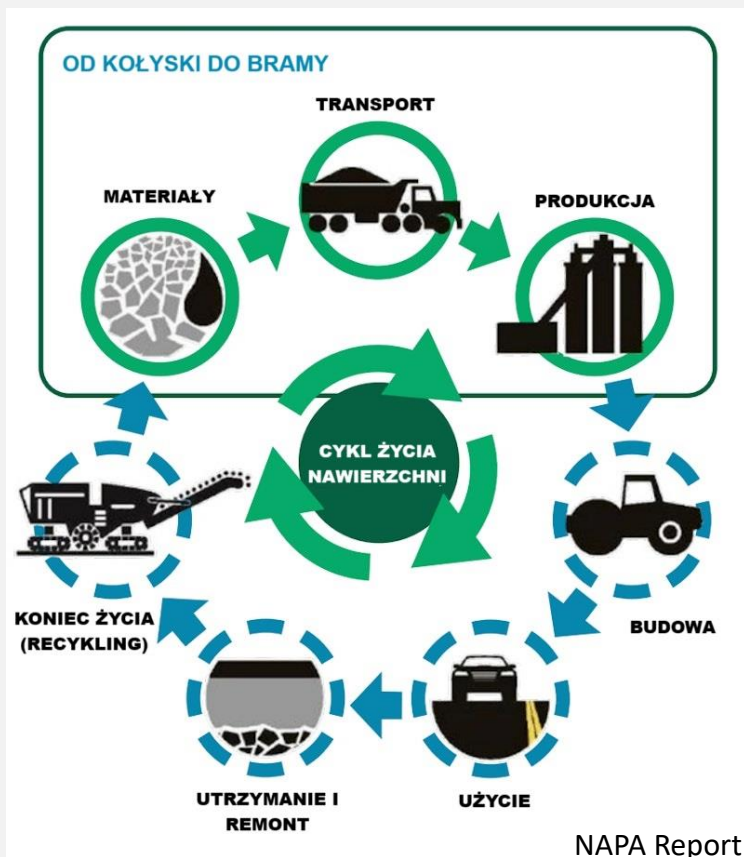
GWP\* [kg CO<sub>2</sub>e] / m<sup>2</sup>\*\*



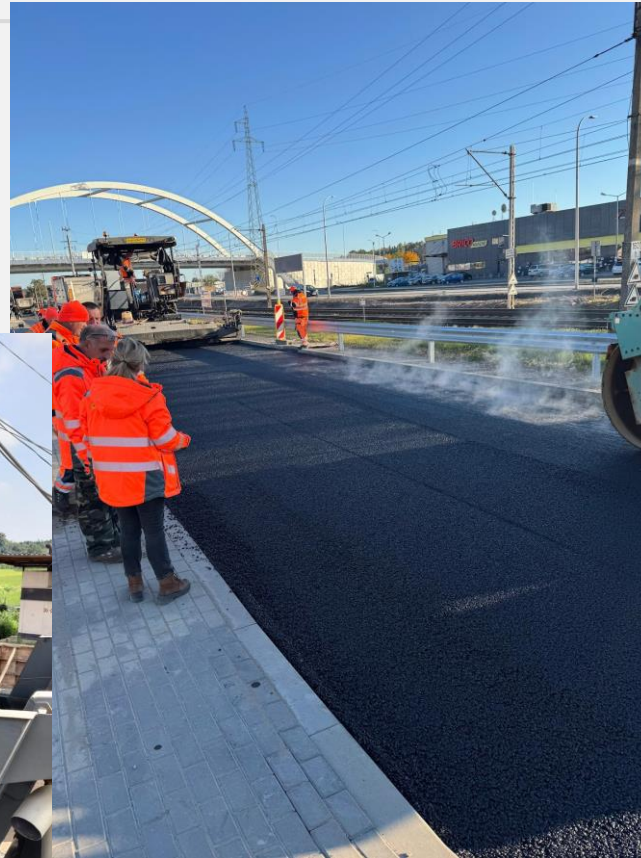
\* the value reduced to 1 year of the service life of the asphalt pavement upper layer

\*\* the thickness of the asphalt pavement upper layer is 5 cm

## SMAPOL® - CO<sub>2</sub> FOOTPRINT









## MODIFICATION - METHODS AND MATERIALS



Dry method

Crumb applied directly to mastic asphalt - replaces the stone fraction (max. 3% of MMA)



Wet method

Powdaer - mixing, heating and curing with asphalt (45 min)

Field blending (>15% of bitumen)

Terminal blending (4-10% of bitumen)

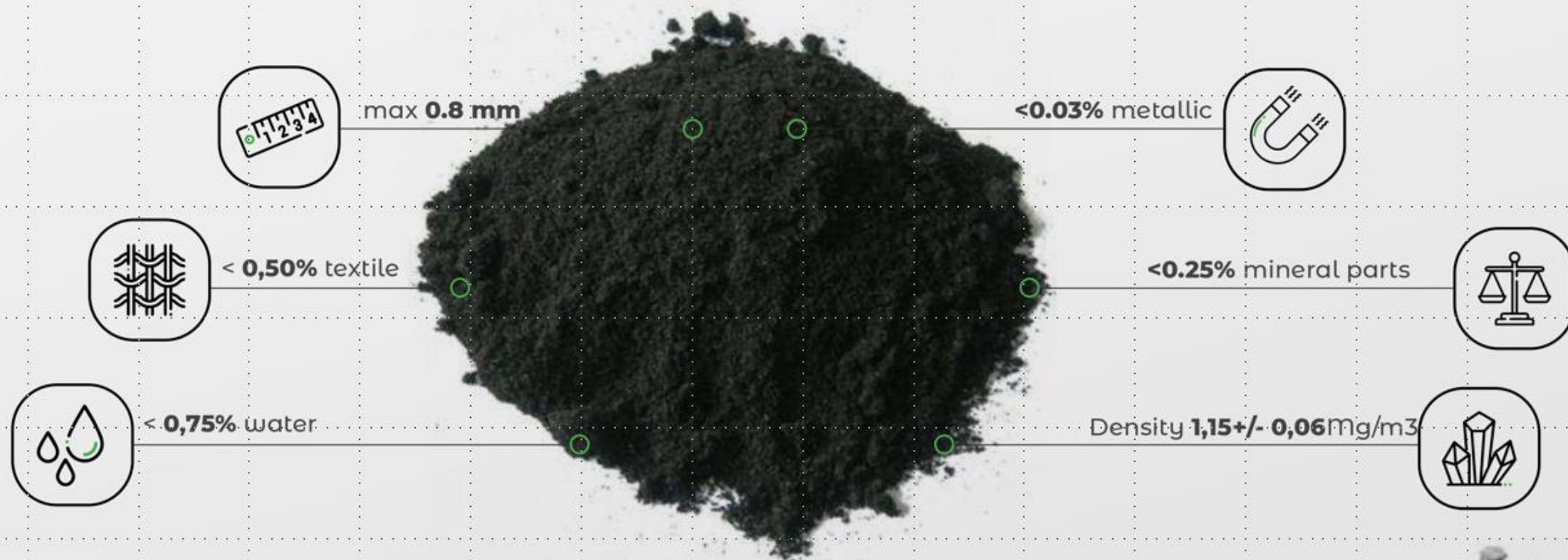


Chemical dissolving - mixing and curing

Terminal blending



## CONSISTENT SPECIFICATION + PC/TT RATIO



**Powderized rubber additive for asphalts**



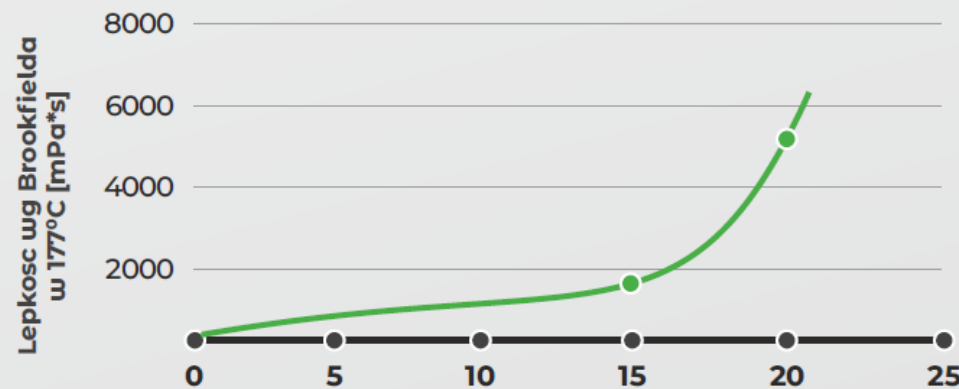
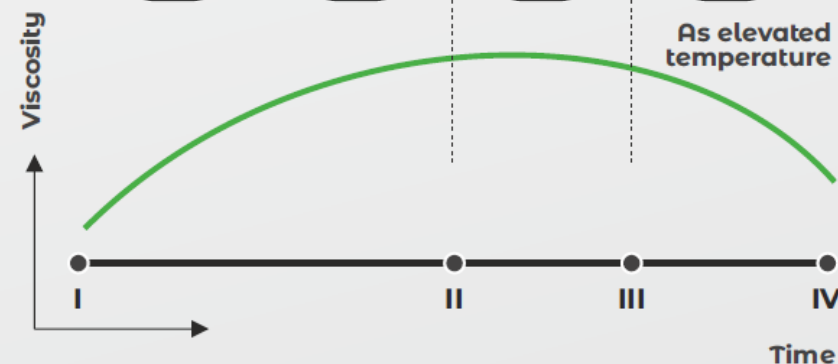
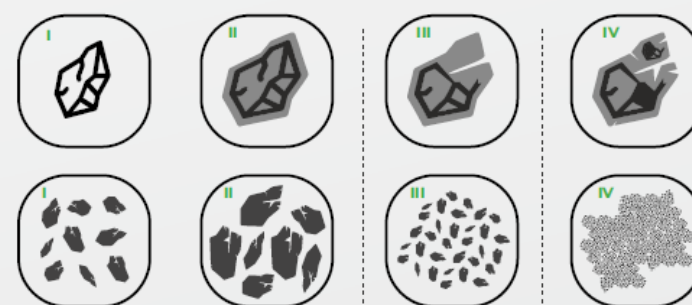
# What they need to control?

## From practice

- Swelling proces
- Consistency «al dente»

## Formally

- Rotational viscosity 1500-5000 mPas PN-EN 13302
- Cone penetration 25-70 x 0,1mm PN-EN 13880-2
- Softening point  $\geq 55^{\circ}\text{C}$  PN-EN 1427
- Resilience  $\geq 18\%$  PN-EN 13302



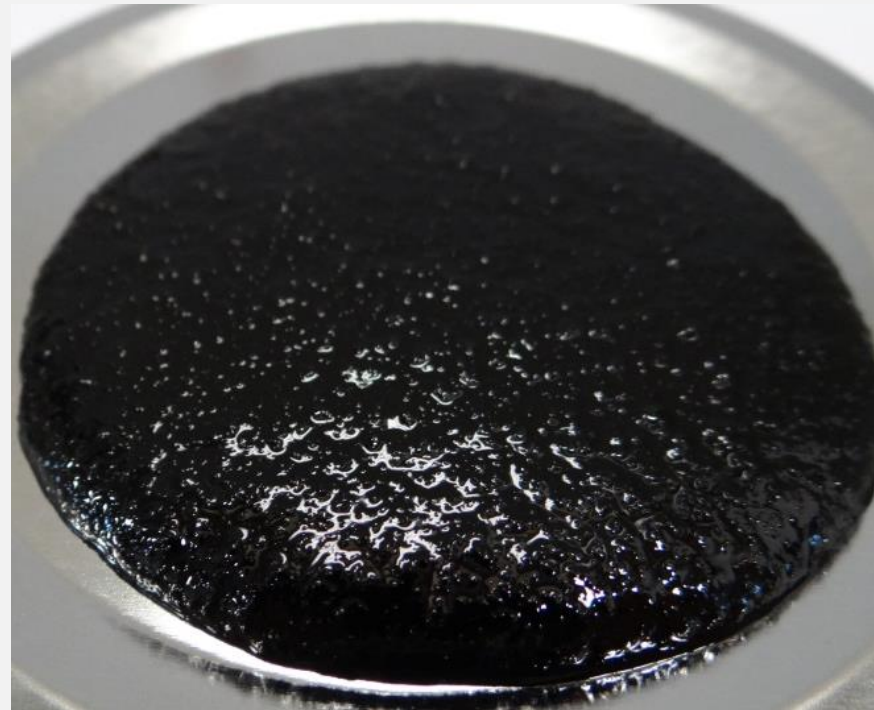
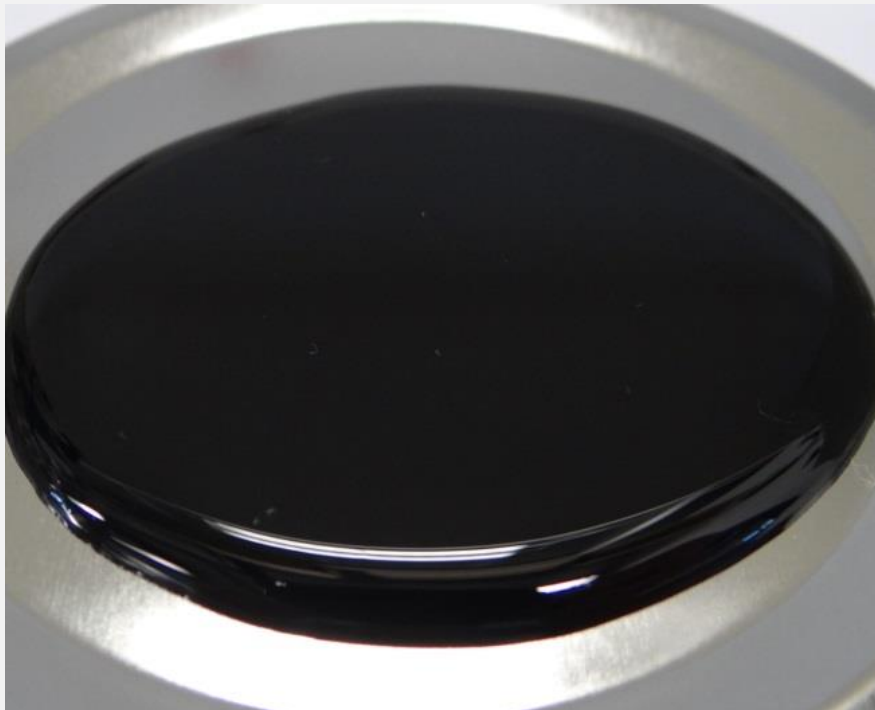


# Al dente

this is how real asphalt is prepared



## PMB VS RMB



## PMB VS RMB





## INCONSISTENCY - COMMENTS



**Green<sup>®</sup>  
Powder**

Rubber powders with high specific surface area and optimal **chemical** composition



**RAR X<sup>™</sup>**  
Enhanced Elastomeric Asphalt Extender

Made of tire rubber powder (60% of the composition) pre-treated with bitumen and other mineral additives



**PelletPAVE<sup>™</sup>**

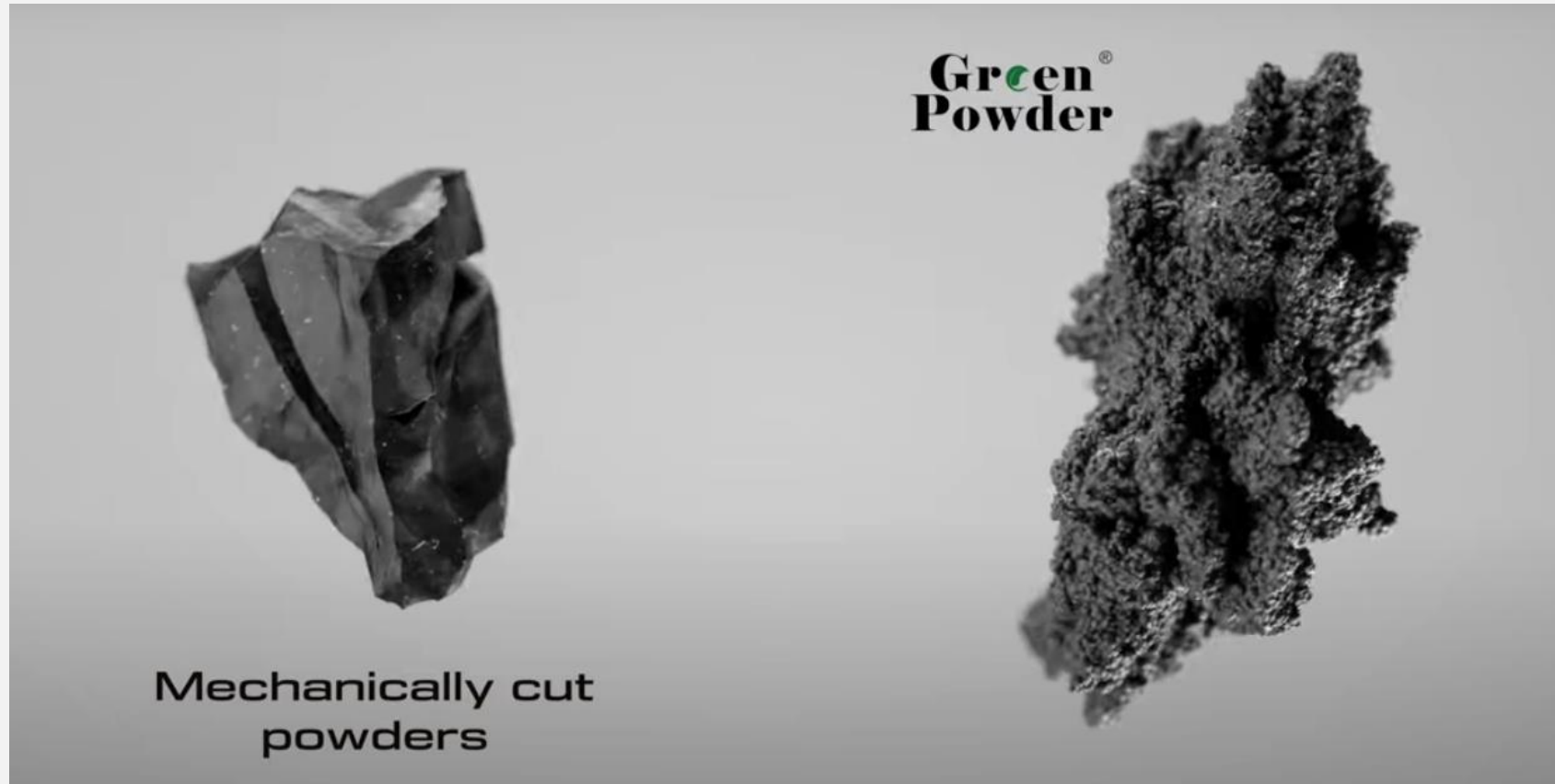
Pellets contain the optimal amount of asphalt, rubber powder (granulate) and various types of additives

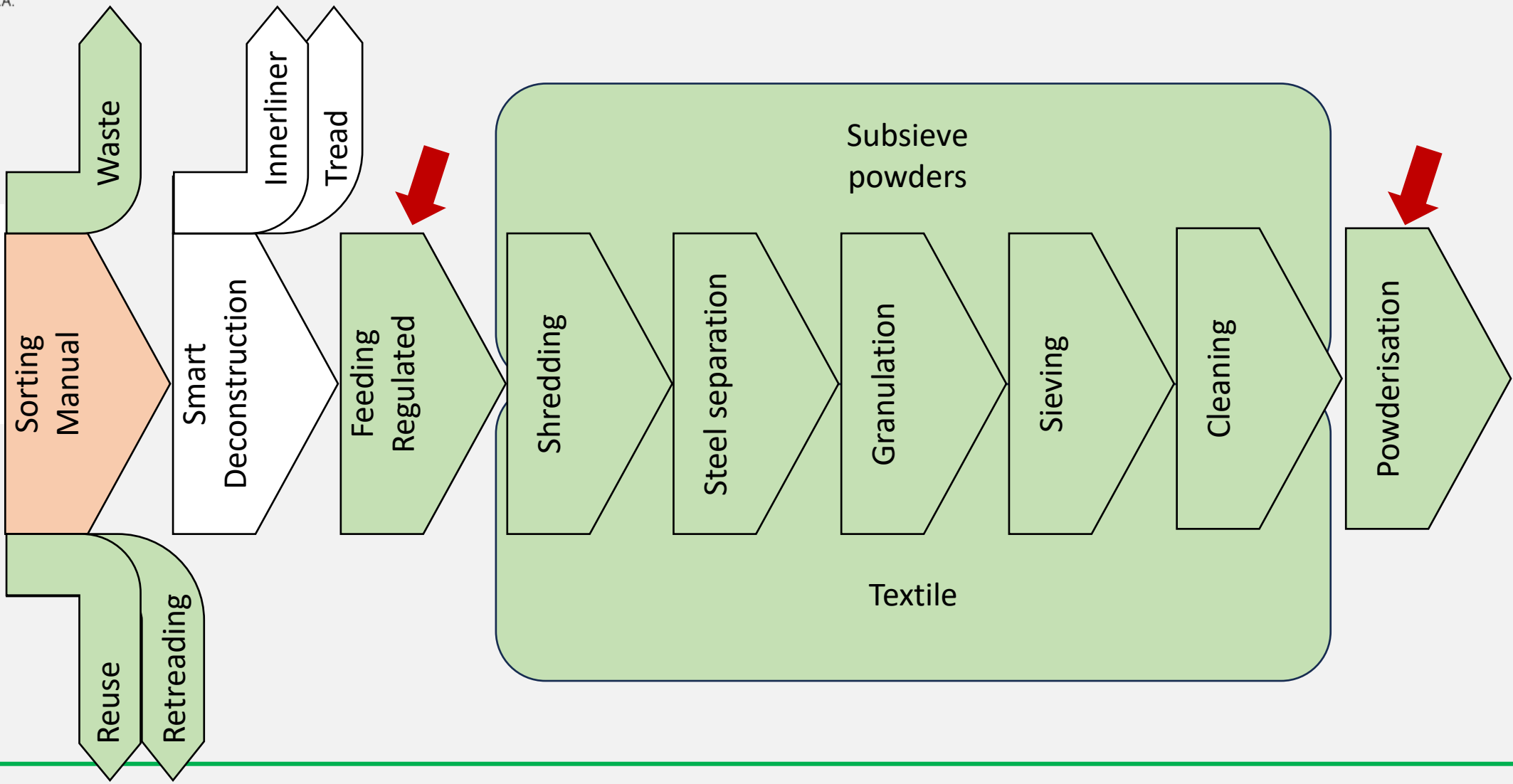


**VESTENAMER<sup>®</sup>**

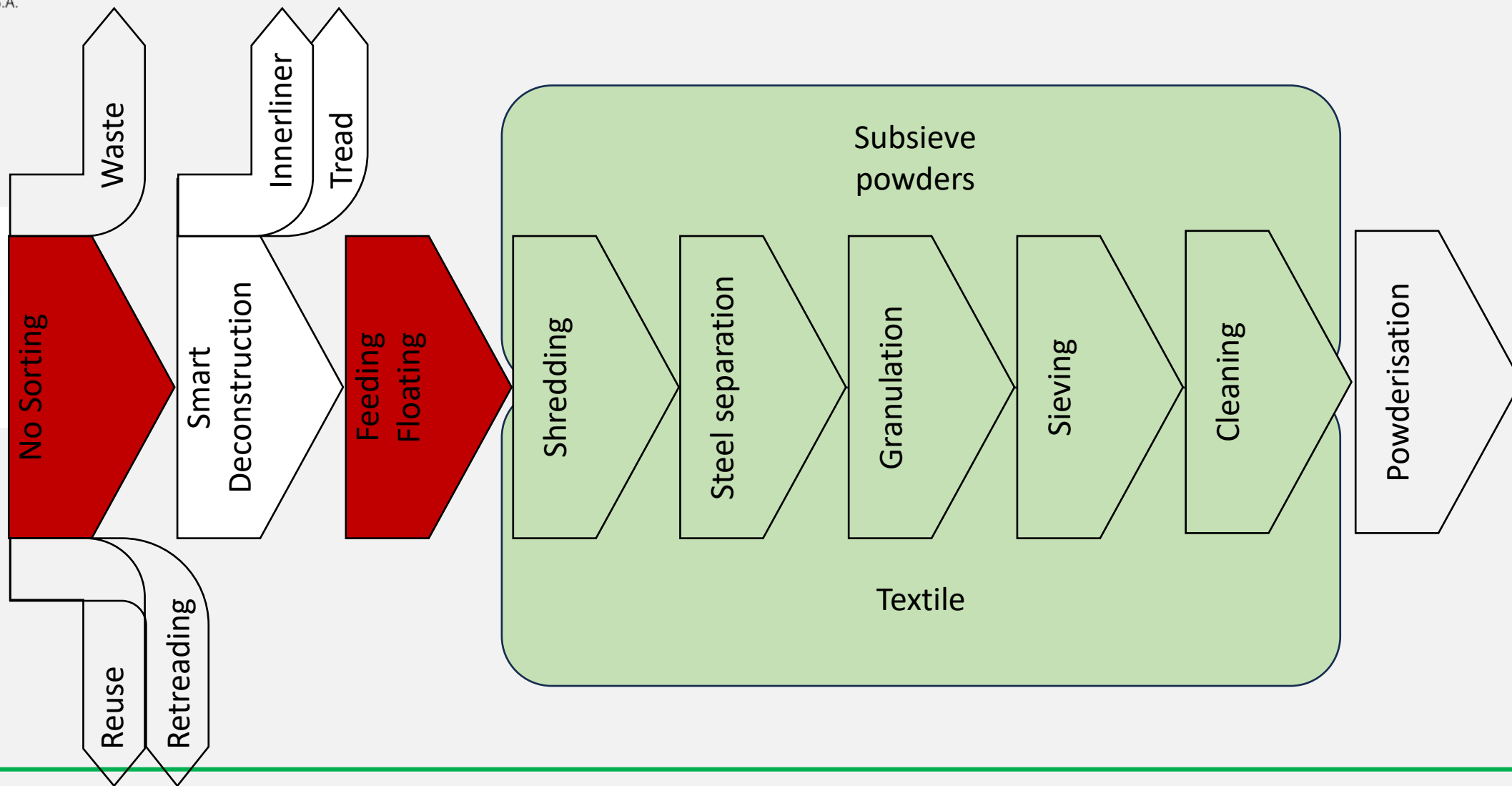
Rubber powder (granulate), cyclooctene, which is polymerized to polyoctenamer, and surfactants

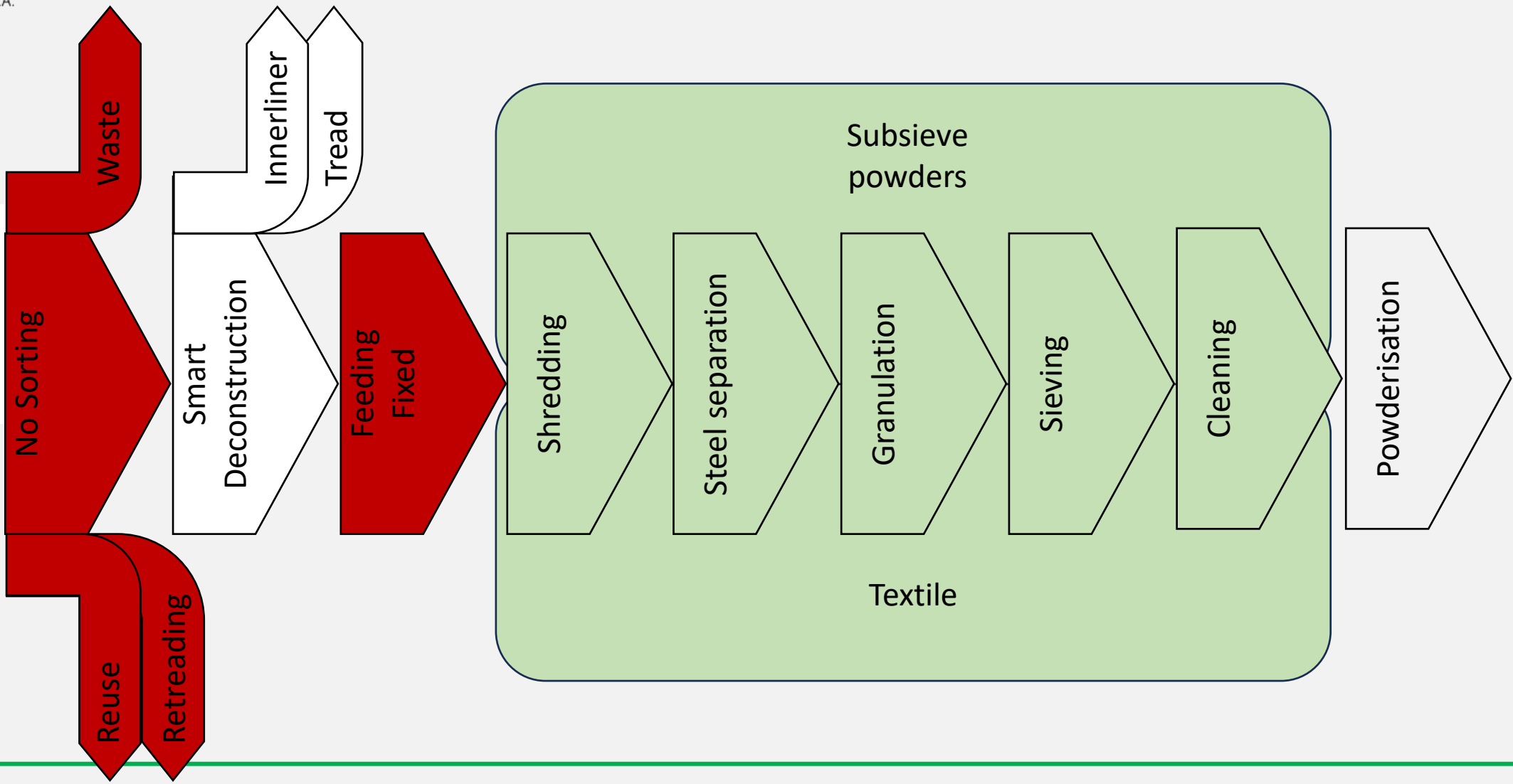
## MICRONISATION - COMMENTS

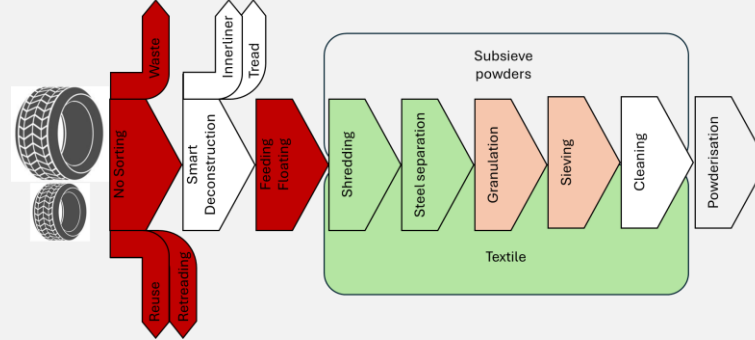
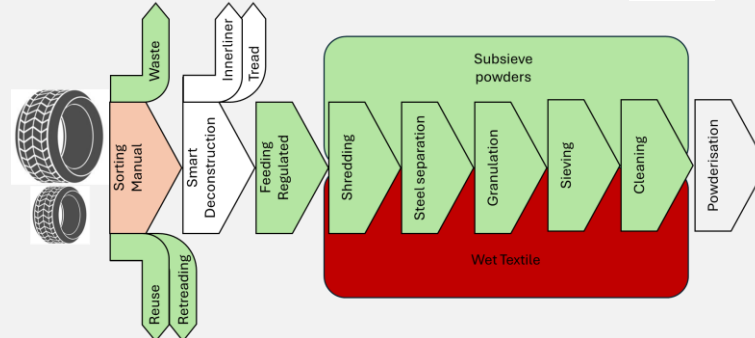
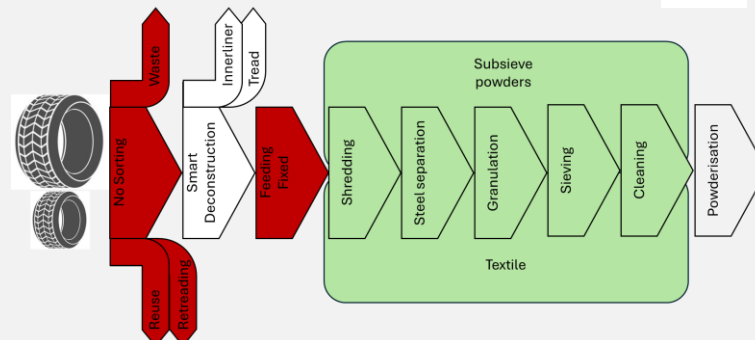
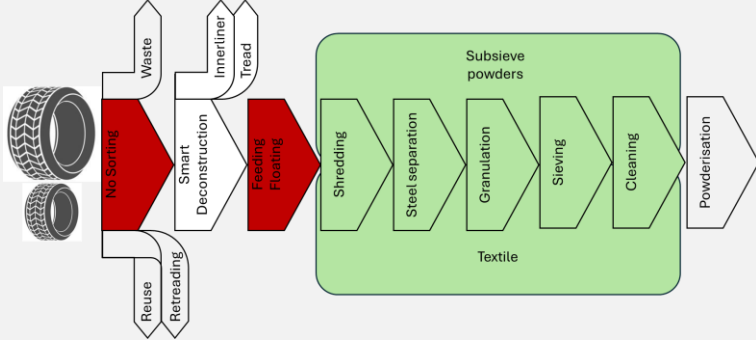
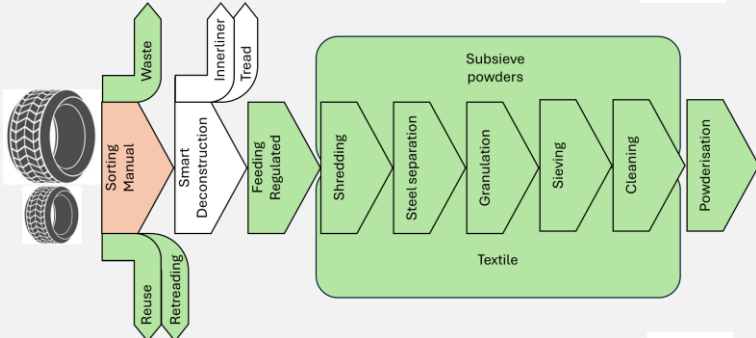
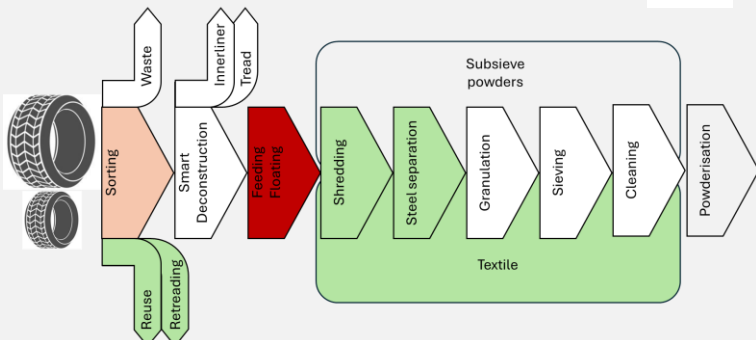












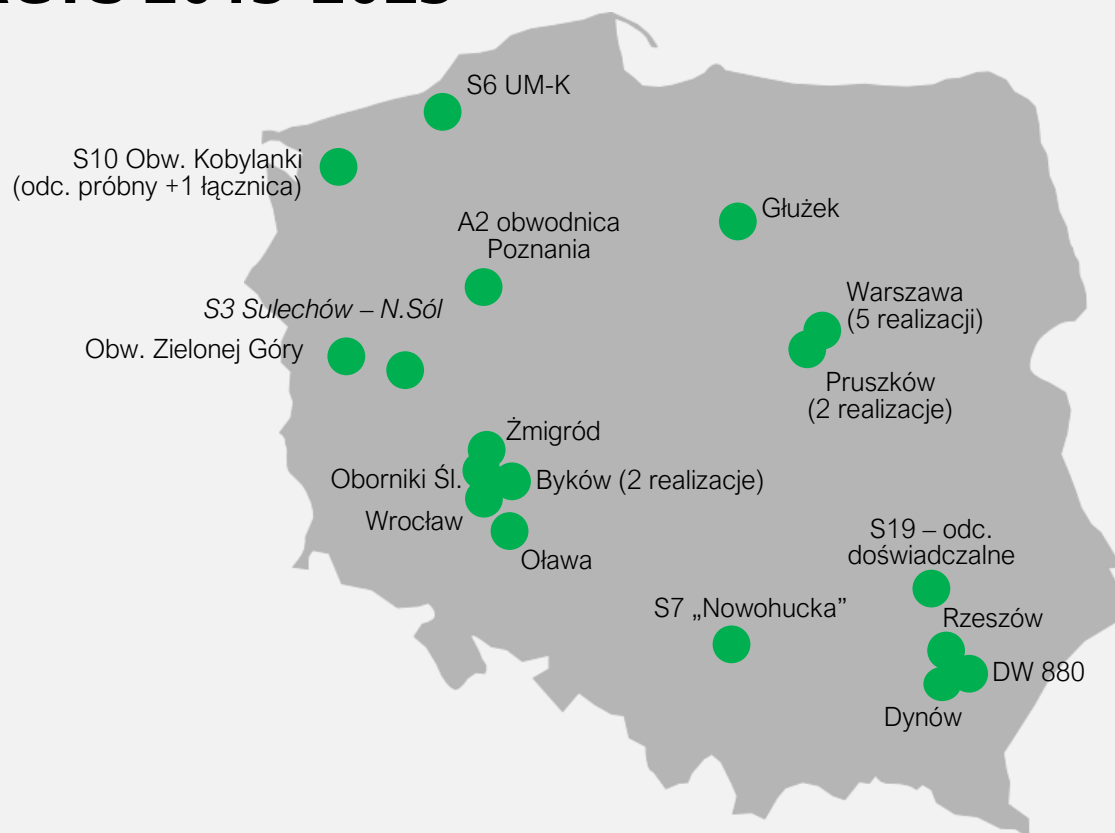


## PRODUCTION EQUIPMENT



**25**  
TON/H

## 28 CONTRACTS 2013-2023



**250 000**  
tons mma

**162 000**  
tyres



## ALL RUBBER – PERFECTION THE TECHNOLOGY WITH NEW LIFE?



2022



SMA 11 S AMG KR 3-7 (melafir)  
SMA 11 S AMG KR 3-7 (gabro)  
AC 16 W AMG KR 3-7 (melafir)  
AC AF 11 P AMG KR 3-7 (dolomit)





# Thank you



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